Claims

1. A method for the conveyance of fine-grained solids in a fluidized bed reactor (1), **characterized in that** a first gas or gas mixture is introduced from below through a gas supply tube (3) into a mixing chamber (7) of the reactor (1), the gas supply tube (3) being at least partly surrounded by a stationary annular fluidized bed (10) which is fluidized by supplying fluidizing gas, and that the gas velocities of the first gas or gas mixture as well as of the fluidizing gas for the annular fluidized bed (10) are adjusted such that the particle Froude numbers in the gas supply tube (3) are between 1 and 100, in the annular fluidized bed (10) between 0.02 and 2 and in the mixing chamber (7) between 0.3 and 30.

2. The method as claimed in claim 1, **characterized in that** the particle Froude number in the gas supply tube (3) is between 1.15 and 20, in particular approximately 8.

3. The method as claimed in claim 1 or 2, **characterized in that** the particle Froude number in the annular fluidized bed (10) is between 0.115 and 1.15, in particular approximately 0.15.

4. The method as claimed in any of the preceding claims, **characterized in that** the particle Froude number in the mixing chamber (7) is between 0.37 and 3.7, in particular approximately 1.8 or approximately 3.

5. The method as claimed in any of the preceding claims, **characterized in that** the bed height of solids in the reactor (1) is adjusted such that the annular fluidized bed (10) extends beyond the upper orifice end of the gas supply tube (3) and that solids are constantly introduced into the first gas or gas mixture and entrained by the gas stream to the mixing chamber (7) located above the orifice region of the gas supply tube (3).

6. The method as claimed in any of the preceding claims, **characterized in that** substances, in particular heated solids, such as cement for example, are cooled in the reactor (1) during the conveyance.

7. The method as claimed in claim 6, **characterized in that** a gas or gas mixture introduced into the reactor (1) is cooled, in particular without heating the solids in the process.

8. The method as claimed in either of claims 6 and 7, **characterized in that** the gas mixture and/or the fluidizing gas introduced via the gas supply tube (3) is air with a temperature below 100°C, in particular of approximately 50°C.

9. The method as claimed in any of claims 6 to 8, **characterized in that** a cooling medium, such as water, is introduced into the annular fluidized bed (10) and/or the mixing chamber (7).

10. The method as claimed in any of claims 1 to 5, **characterized in that** the solids are heated in the reactor (1).

11. The method as claimed in claim 10, **characterized in that** solids containing titanium-containing ores, iron oxide or further metal oxides are used as the solids.

12. The method as claimed in either of claims 10 or 11, **characterized in that** heated gas, for example hydrogen or exhaust gas with a temperature of approximately 900°C, is supplied to the reactor (1) through the gas supply tube (3), into the annular fluidized bed (10) and/or through lances (12) or the like into the mixing chamber (7).

13. The method as claimed in any of claims 10 to 12, **characterized in that** a fuel, in particular natural gas, is supplied to the reactor (1) through the gas supply tube (3), into the annular fluidized bed (10) and/or through lances (12) or the like into the mixing chamber (7), and that the pressure in the reactor (1) is between 0.8 and 10 bar.

14. The method as claimed in any of claims 10 to 13, **characterized in that** solids containing iron oxide are at least partly heated and/or calcined in at least one pre-heating stage and reduced in a downstream reduction stage, the solids being transported from the at least one pre-heating stage into the downstream reduction stage by means of the reactor (1) serving as a flash heater.

15. The method as claimed in claim 14, **characterized in that** the exhaust gases from the reactor (1) are passed to the at least one pre-heating stage, which has a reactor with a circulating fluidized bed and/or a venturi pre-heater.

16. The method as claimed in either of claims 14 and 15, **characterized in that** a fuel is supplied to the reactor (1) serving as a flash heater and the pre-heating stage(s) are operated substantially with the waste heat of the reactor (1).

17. The method as claimed in any of the preceding claims, **characterized in that** the actual outlet temperature of the solids from the reactor (1) is measured and that, in dependence on the measured actual outlet temperature in relation to a set point outlet temperature, the supply of cold or heated gases or gas mixtures, a cooling medium and/or fuels, is varied.

18. A plant for the conveyance of fine-grained solids, in particular for performing a method as claimed in one of claims 1 to 17, comprising a reactor (1) constituting a fluidized bed reactor, **characterized in that** the reactor (1) has a gas

supply system which is formed such that gas flowing through the gas supply system entrains solids from a stationary annular fluidized bed (10), which at least partly surrounds the gas supply system, into the mixing chamber (7).

19. The plant as claimed in claim 18, **characterized in that** the gas supply system has at least one gas supply tube (3) extending upwards substantially vertically from the lower region of the reactor (1) into the mixing chamber (7) of the reactor (1), the gas supply tube (3) being at least partly surrounded by an annular chamber in which the stationary annular fluidized bed (10) is formed.

20. The plant as claimed in claim 19, **characterized in that** the gas supply tube (3) is arranged approximately centrally with reference to the cross-sectional area of the reactor (1).

21. The plant as claimed in any of claims 18 to 20, **characterized in that** a separator, in particular a cyclone (9), a hot-gas electrostatic precipitator or a bag filter is provided downstream of the reactor (1) for separating solids.

22. The plant as claimed in any of claims 19 to 21, **characterized in that** provided in the annular chamber of the reactor (1) is a gas distributor (5) which divides the chamber into an upper fluidized bed region (10) and a lower gas distributor chamber (4), and that the gas distributor chamber (4) is connected to a supply conduit (6) for fluidizing gas.

23. The plant as claimed in any of claims 19 to 22, **characterized in that** the reactor (1) has at least one supply conduit (6) for fuel and/or a cooling medium leading to the gas supply tube (3) and/or at least one such supply conduit (6) leading to the annular chamber.